UNIVERSITI TEKNOLOGI MARA

COMPRESSIVE STRENGTH AND CHLORIDE RESISTANT OF WPSA GEOPOLYMER CONCRETE CONTAINING RCA

WAN MUHAMMAD FARIS BIN W. YUSOFF

Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science

Faculty of Civil Engineering

June 2015

CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 8 January 2015 to conduct the final examination of Wan Muhammad Faris Bin W. Yusoff on his Master of Science thesis entititled "Compressive Strength and Chloride Resistant of WPSA Geopolymer Concrete Containing RCA" in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiners recommends that the student be awarded the relevant degree. The Panel of Examiners was as follows:

Siti Rashidah Mohd Nasir, PhD
Faculty of Civil Engineering
Universiti Teknologi MARA
(Chairman)

Nor Hayati Abdul Hamid, PhD
Associate Professor
Faculty of Civil Engineering
Universiti Teknologi MARA
(Internal Examiner)

Abdul Rahman Mohd. Sam, PhD
Associate Professor
Faculty of Civil Engineering
Universiti Tekonologi Malaysia
(External Examiner)

SITI HALIJJAH SHARIFF, PhD
Associate Professor
Dean
Institute of Graduates Studies
Universiti Teknologi MARA
Date: 11 June, 2015

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student	:	Wan Muhammad Faris bin W. Yusoff
Student I.D.No.	:	2009981225
Programme	:	Master of Science
Faculty	:	Civil Engineering
Thesis Title	:	Compressive Strength and Chloride Resistant of WPSA Geopolymer Concrete Containing RCA
Signature of Student	:	.....
Date	:	June 2015

ABSTRACT

The production of cement used high amount of energy and release high amount of green house gases to atmosphere such as carbon dioxide (CO_2) that causes an environmental problem. The use natural aggregate as an aggregate in the concrete production can cause depletion of virgin aggregate. In order to cater this problem, an alternative method needs to be studied. Geopolymer concrete is a green concrete material that produces by using pozzolanic material without the presence of cement. This concrete material was generated by the geopolymerization process between Silicon (Si) and Aluminium (Al) element in the source material with the alkaline activator. This research is focusing on the production of the geopolymer concrete using waste paper sludge ash (WPSA) as the main binder and the recycle concrete aggregate (RCA) as the aggregate. The compressive strength and the chloride permeability were studied in order to determine the potential of these materials in geopolymer. The combination of sodium hydroxide solution and sodium silicate solution were used to activate the Si and Al element in the WPSA material. The aggregates replacement level of 25%, 50%, 75% and 100% of RCA in the geopolymer concrete mixture were used. The concrete samples of size 100mm x 100mm x 100mm cube and 100mm (dia.) x 50mm was casted. The WPSA geopolymer concrete specimens were cured in the oven for 24 hour at 60°C temperature before being cured at ambient condition until the age for testing. The geopolymer concrete were tested their compressive strength at 3, 7, 28, 56 and 90 days of ages. Meanwhile, the rapid chloride permeability test (RCPT) was used to determine the chloride penetration of WPSA geopolymer concrete at the age of 7 and 28 day. The compressive strength and permeability of chloride of the WPSA geopolymer concrete specimens was analyzed. It is concluded that the WPSA geopolymer concrete exhibit a lower compressive strength compared to the geopolymer concrete that using low calcium pozzolanic material such as fly ash and slag. The RCPT test value shows that WPSA geopolymer concrete was high permeable to the chloride. Based on the finding, WPSA geopolymer concrete can be categorized as a low strength concrete hence it can be utilized as a non-structural material for construction purposes.

TABLE OF CONTENTS